

**What is claimed is:**

- 1           1.       An interface device for coupling a group of service cards of a packet based  
2 switch to a switching core thereof, said group of service cards including one or more on-  
3 line service cards and one or more protection cards, said device comprising:  
4           a plurality of core side input and output ports for coupling to said switching core  
5 and a plurality of card side input and output ports for coupling to said service cards;  
6           a data flow switch function coupled between said core side ports and said card  
7 side ports, said data flow switch function operable to complete data flow paths between  
8 said core side ports and said card side ports; and  
9           a link failure detector operable to detect a communications failure on a  
10 communications link associated with one of said on-line service cards, said link failure  
11 detector further operable to alter said data flow switch function such that one or more of  
12 said data flow paths associated with one of said on-line service cards are switched to one  
13 of said protection cards.
- 1           2.       The device of Claim 1, wherein a bandwidth allotment between said  
2 service cards and said interface device is greater than available bandwidth between said  
3 switching core and said interface device, thereby enabling connection of said protection  
4 cards without corresponding usage of switching core bandwidth.
- 1           3.       The device of Claim 1, further including an aggregation function coupled  
2 between said card side ports and said core side ports, said aggregation function operable  
3 to combine multiple data streams into larger bandwidth threads.
- 1           4.       The device of Claim 3, wherein said data flow switch function switches  
2 threads between said on-line cards and said protection card.
- 1           5.       The device of Claim 1, further including a digital processor coupled to  
2 said link failure detector, said digital processor being coupled to said data flow switch  
3 function to control the activation thereof in response to detection of a link failure.

1           6.       The device of Claim 5, wherein each of said service cards is assigned an  
2 address, each packet traversing said switch also having an address, wherein upon  
3 detection of a link failure, said processor is operable to swap the address of one or more  
4 of said ports assigned to a failed on-line service card with that of said ports assigned to a  
5 protection service card to thereby accomplish data flow switching to said protection card.

1           7.       The device of Claim 6, wherein said data flow switching is accomplished  
2 on a per flow basis, data flow switching of one particular flow not affecting other  
3 different flows in said switch.

1           8.       The device of Claim 6, wherein said address swap of on-line service card  
2 and protection card is accomplished in a look-up table.

1           9.       The device of Claim 6, wherein said address is a hierarchical address  
2 scheme having multiple fields pertaining to various type links within said interface.

1           10.      The device of Claim 1, wherein said link failure detector includes a  
2 monitor to detect failures selected from the group consisting of bit interleaved parity,  
3 parity, and CRC.

1           11.      The device of Claim 1, wherein said link failure detector includes a  
2 receiver for monitoring per flow test cells.

1           12.      The device of Claim 1, wherein said service cards are layer 2 or layer 3  
2 cards.

1           13.      The device of Claim 12, wherein said service cards are selected from the  
2 group consisting of ATM, IP frame relay and TDM.

1           14.      The device of Claim 12, wherein said service cards include traffic  
2 management functionality.

1           15.     The device of Claim 3, wherein said interface device includes at least one  
2     serializer/deserializer coupled to said aggregator.

1           16.     An interface device for reducing the amount of core bandwidth necessary  
2     to be allotted to support both on-line service cards and back up protection cards in a  
3     multiservice switch, said device being coupled between said service cards and said  
4     switching core, said device comprising:

5           a first plurality of input and output ports for coupling to both said on-line service  
6     cards and said protection cards;

7           a second plurality of input and output ports coupled to said switching core;

8           a data flow switch function coupled between said first plurality of input and  
9     output ports and said second plurality of input and output ports;

10          a link failure detector also coupled between first plurality of input and output  
11     ports and said second plurality of input and output ports; and

12          a controller coupled to said link failure detector and said data flow switch  
13     function, said controller operable to switch a data flow route between said service cards  
14     and said switching core from one of said on-line service cards to one of said protection  
15     cards upon detection of a link failure by said link failure detector.

1           17.     The device of Claim 16, wherein a bandwidth allotment between said  
2     service cards and said interface device is greater than the available bandwidth between  
3     said switching core and said interface device, thereby enabling connection of said  
4     protection cards without corresponding usage of switching core bandwidth.

1           18.     The device of Claim 16, further including an aggregation function coupled  
2     between said first plurality of ports and said second plurality of ports, said aggregation  
3     function operable combine multiple data streams into larger bandwidth threads.

1           19.     The device of Claim 16, said data flow switch function switches threads  
2     between said on-line cards and said protection card.

1           20.     The device of Claim 16, wherein said data flow switching is accomplished  
2     on a per flow basis, data flow switching of one particular flow not affecting other  
3     different flows in said switch.

1           21.     The device of Claim 16, wherein each of said service cards is assigned an  
2     address, each packet traversing said switch also having an address, wherein upon  
3     detection of a link failure, said processor is operable to swap the address of one or more  
4     of said ports assigned to a failed on-line service card with that of said ports assigned to a  
5     protection service card to thereby accomplish data flow switching to said protection card.

1           22.     The device of Claim 21, wherein said address swap of on-line service card  
2     and protection is accomplished in a look-up table.

1           23.     The device of Claim 21, said address is a hierarchical address scheme  
2     having multiple fields pertaining to various type links within said interface.

1           24.     A method of coupling equipment specific service cards to a switching core  
2     in a multiservice switch in order to conserve switching core bandwidth, said method  
3     comprising the steps of:

4                 coupling on-line and protection service cards to said switching core through a  
5     core interface device, said core interface device including a data flow switch function for  
6     coupling service card side ports with core side ports thereof, said core interface device  
7     providing a given redundancy ratio of protection cards to on-line service cards;

8                 detecting a link failure associated with an on-line protection card; and

9                 altering said data flow function in response to detection of said link failure to  
10     provide one or more data flow paths from said on-line service cards to said protection  
11     service cards.

- 1           25.    The device of Claim 24, wherein a bandwidth allotment between said  
2   service cards and said interface device is greater than the available bandwidth between  
3   said switching core and said interface device, thereby enabling connection of said  
4   protection cards without corresponding usage of switching core bandwidth.

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